Claims

[c1] A system for separating an emulsion fluid into a recovered fluid and a purified fluid, the emulsion fluid comprising a continuous phase and a dispersed phase, the purified fluid being essentially constituted of the continuous phase, the system comprising:

a vessel (38, 48) at an inlet of which the emulsion fluid may flow;

one or more coalescing element (37a, 37b), each coalescing element allowing to coalesce at least a portion of the dispersed phase into large drops further detached from the coalescing element upon a flow of the emulsion fluid;

one or more guiding mean (33a, 33b, 43), each guiding mean being associated with one coalescing element (37a, 37b) to guide the detached large drops for further recovery.

[c2] The system of claim 1, further comprising :

one or more bed (31a, 31b, 47), each bed allowing to support one coalescing element (37a, 37b);

one or more recovery outlet (39a, 39b, 49), each recovery outlet allowing to recover the recovered fluid from large drops detached from one coalescing element (37a, 37b).

[c3] The system according to any one of claims 1 to 2, wherein

the guiding means (33a, 33b, 43) is a separator packing, the separator packing having a structure that is adapted to allow the continuous phase to flow through the separator packing.

[c4] The system according to claim 3, wherein

each separator packing (43) is substantially located at 10 millimeters of the associated coalescing element so as to allow a burst of bubbles (41) of the

continuous phase, the bubbles being surrounded by a film of the dispersed phase, and the bubbles being formed between the coalescing element and the separator packing.

[c5] The system according to any one of claims 1 to 4, wherein each separator packing (33a, 33b, 43) comprises:

a plurality of plates (51) disposed at an output of the at least one associated coalescing element (37a, 37b) to intercept the large drops; and wherein :

the dispersed phase comprises oil droplets;

the plurality of plates (51) are made of an oleophilic material so that the intercepted large drops adhere to the plates;

the plurality of plates (51) have a diagonal orientation adapted for guiding the adhered large drops upward.

[c6] The system according to any one of claims 1 to 5, wherein

the emulsion fluid is a produced water associated with a production of hydrocarbons;

the coalescing element is a Reusable Polymer Absorbent.

[c7] A method for separating an emulsion fluid into a recovered fluid and a purified fluid, the emulsion fluid comprising a continuous phase and a dispersed phase, the purified fluid being essentially constituted of the continuous phase, the method comprising :

providing a flow of at least a portion of the emulsion fluid through at least one bed (31a, 31b, 47) within a vessel (38, 48), each bed supporting a coalescing element (37a, 37b), whereby at least a portion of the dispersed phase coalesces into large drops;

detaching the coalesced large drops from each bed (31a, 31b, 47) by means of a flow velocity;

guiding the detached large drops with at least one guiding mean (33a, 33b, 43), the at least one guiding mean being associated with the at least one bed (31a, 31b, 47); and

recovering the recovered fluid from the guided large drops.

[c8] The method of claim 7, further comprising :

repeating the coalescing, the detaching, the guiding and the recovering at a further location of the vessel (38, 48).

[c9] The method of any one of claims 7 to 8, wherein :

the dispersed phase comprises droplets of oil.

[c10] The method of any one of claims 7 to 9, wherein :

the guiding means (33a, 33b, 43) is a separator packing, the separator packing having a structure that is adapted to allow the continuous phase to flow through the separator packing;

the method further comprising:

intercepting the coalesced large droplets with at least one plate (51) of the separator packing, the large droplets adhering onto the at least one plate;

guiding the adhered large droplets along the at least one plate (51) upon a flow velocity.

[c11] The method of any one of claims 7 to 10, wherein :

the emulsion fluid is a produced water associated with a production of hydrocarbons;

the coalescing element is a Reusable Polymer Absorbent.

[c12] A system for separating an emulsion fluid into a recovered fluid and a purified fluid, the emulsion fluid comprising a continuous phase (65, 75), a dispersed phase

(67) and a coalesced portion (66, 76), the purified fluid being essentially constituted of the continuous phase, the system comprising:

a vessel (68, 78) at an inlet of which the emulsion fluid may flow;

at least one bed (61, 71b) supporting a coalescing element (63, 73), the coalescing element allowing to coalesce at least a portion of the dispersed phase (67) into large drops (69, 79b) detached from the coalescing element upon a flow of the continuous phase;

at least one weir (64, 74) located along the at least one bed (61, 71b) at an upstream side of the at least one bed, each weir allowing to prevent the coalesced portion (66, 76) to flow through an associated bed.

[c13] The system of claim 12, further comprising :

a recovery outlet (62, 72) located at the upstream side of the bed (61, 71b), the recovery outlet allowing to recover the coalesced portion (66, 76).

[c14] The system of claim 13, wherein :

the coalesced portion (66) results from a pre-treatment of the emulsion fluid before flowing through the bed (61).

[c15] The system of claim 13, further comprising :

a plurality of beds (71a, 71b), each bed supporting an associated coalescing element (63, 73); and wherein

the coalesced portion (76) provides from previous large drops (79a) generated at a distinct previous bed (71a).

[c16] The system of any one of claims 12 to 15, wherein

the dispersed phase comprises oil droplets (67);

the weir (64, 74) is positioned at an upper portion of the vessel (68, 78).

[c17] The system according to any one of claims 12 to 16, wherein

the emulsion fluid is a produced water associated with a production of hydrocarbons;

the coalescing element is a Reusable Polymer Absorbent.

[c18] A method for separating in a vessel an emulsion fluid comprising a continuous phase (65, 75), a dispersed phase (67) and a coalesced portion (66, 76), into a recovered fluid and a purified fluid, the purified fluid being essentially constituted of the continuous phase, the method comprising:

preventing the coalesced portion (66, 76) to flow through a bed (61, 71b) located in the vessel;

coalescing at least a portion of the dispersed phase (67) into large drops (69, 79b), wherein the coalescing is performed by means of a coalescing element (63, 73) supported by the bed (61, 71b), and wherein the large drops (69, 79b) are detached from the coalescing element (63, 73) upon a flow of the continuous phase.

[c19] The method of claim 18, wherein :

the preventing is performed by inserting a weir (64, 74b) along the bed (61, 71b) at an upstream side of the bed.

[c20] The method of claim 19, wherein the coalesced portion (66, 76) results from a pre-treatment of the emulsion fluid within the vessel (68).

[c21] The method of claim 19, wherein the coalesced portion (66, 76) results from a coalescing action of a distinct coalescing element (73a) supported by a distinct previous bed (71a) within the vessel (68).

[c22] The method according to any one of claims 18 to 21, wherein

the emulsion fluid is a produced water associated with a production of hydrocarbons;

the coalescing element is a Reusable Polymer Absorbent.